

WBS 1.4 Tile Calorimeter

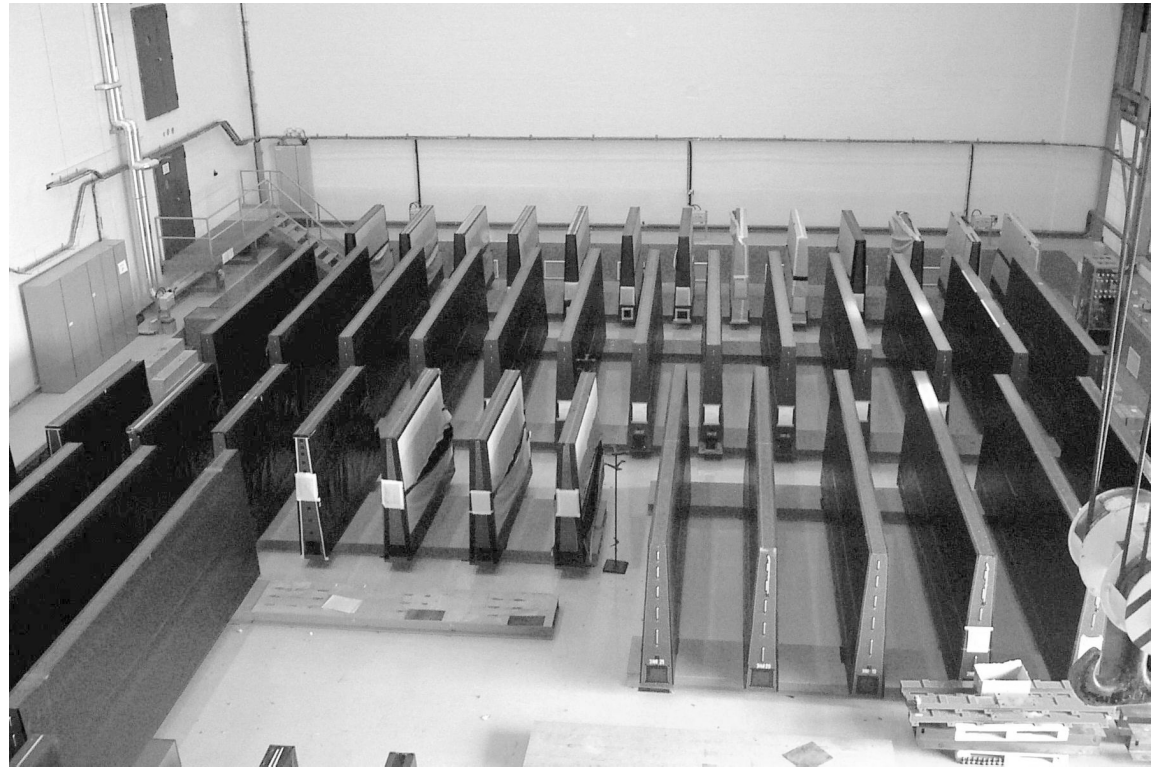
PAP Meeting
March 21 2002

Larry Price
ANL



Technical Status

- **1.4.1 Mechanics**
 - ◆ **Submodules 97% complete**
 - UI and UC work is complete
 - ◆ **49 of 64 modules mech. assembled**
 - 43 instrumented and tested; 38 shipped
 - ◆ **All parts are on hand for completion after recent shipment of girders**

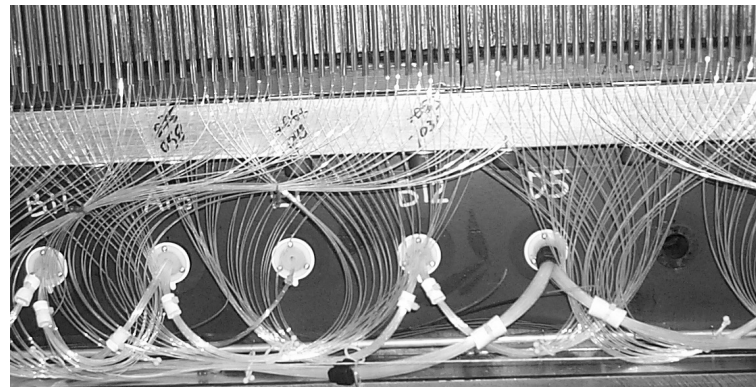


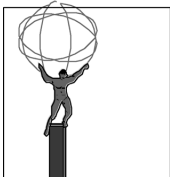


Technical Status

- **1.4.2 Instrumentation**

- ◆ 43 modules have been instrumented and tested
- ◆ 38 have been shipped to CERN
- ◆ Move to new building at MSU will produce a month's delay
- ◆ Fibers continue to arrive (from Lisbon) about 1 month before needed

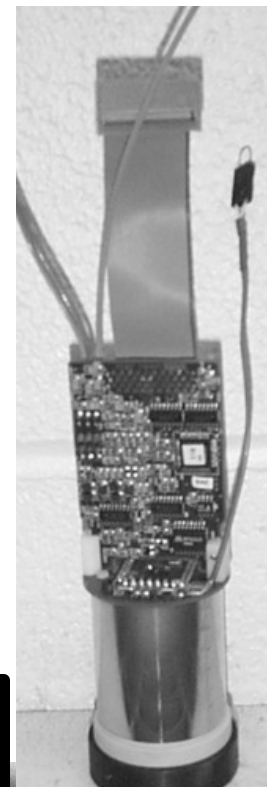




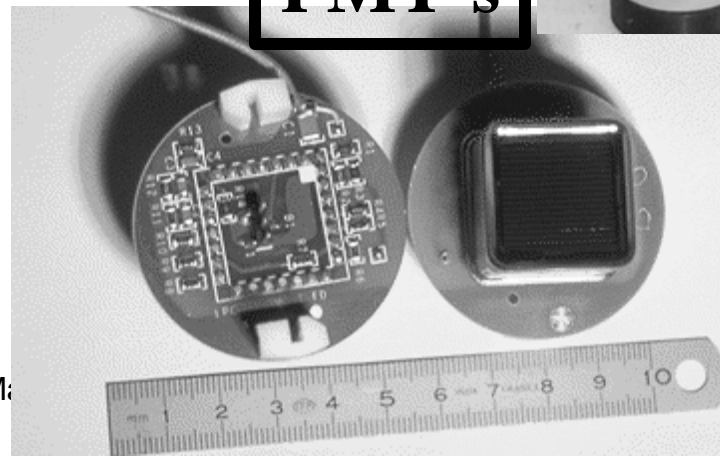
Technical Status

• 1.4.3 Readout

- ◆ STEP2 (pulsed) light testing of PMTs started in January
- ◆ STEP 1 continuing routinely at UI and UTA
- ◆ Front end 3-in-1 cards all tested.
 - 6% need (mostly minor) repairs
- ◆ Mother Boards all delivered and 25% tested
- ◆ Optical Interface Cards:
 - about to let contract for assembly in Taiwan
 - All parts on hand except optical transmitters coming from Taiwan
 - PRR completed in November



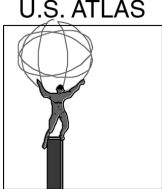
PMT's





Technical Status

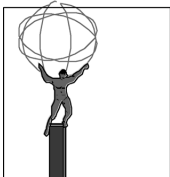
- **1.4.4 Intermediate Tile Calorimeter**
 - ◆ **110 ITC Submodules shipped to ANL and Barcelona**
 - ◆ **About to place order for gap scintillator**
 - ◆ **Final drawings made for approval of crack (cryostat) scintillator boxes**



ETC02 Cost Comparison

Tile – WBS Level 3

(Project AYk\$s)			
	Baseline Budget (ETC01 FY02-FY05 + Carryover)	Final ETC02 (FY02-FY05)	
WBS	Budget (AYk\$s)	ETC Budget (AY\$s)	Delta
141 Barrel Mechanics	453.1	549.3	(96.2)
142 Barrel Optics	100.4	163.1	(62.7)
143 Readout	359.7	359.7	0.0
144 Intermediate Tile Cal	632.4	632.4	0.0
Total	1,545.6	1,704.5	(158.9)



Explanation of Significant Cost Changes

1.4.1 Mechanics (\$96K)

Submodule repairs

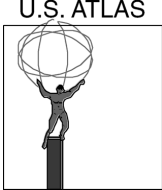
Shop work on special submodules

Repairs to QC/testing system

Rigging costs

1.4.2 Module instrumentation (\$63k)

Repairs to early modules at CERN

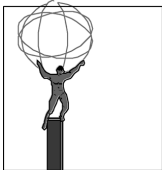


ETC02 Cost Profile

Tile – WBS Level 3

Tile ETC 02 Profile (Project K\$s)

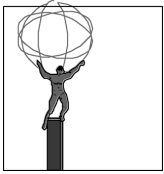
WBS	FY00	FY01	FY02	FY03	FY04	FY05	FY06	Total
141 Barrel Mechanics			416.6	129.1				545.7
142 Barrel Optics			163.1					163.1
143 Readout			359.8					359.8
144 Intermediate Tile Cal			632.3					632.3
1.4 Total (FY02\$s)	0.0	0.0	1,571.8	129.1	0.0	0.0	0.0	1,700.9
1.4 Total (AY\$s)	0.0	0.0	1,571.8	132.7	0.0	0.0	0.0	1,704.5



Tile Milestones

Level 2 Milestones

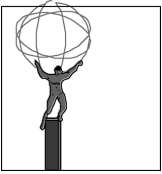
Subsystem	Schedule Designator	Description	ETC 01 Schedule Date	ETC 02 Schedule Date
Tile	Tile L2/1	Start Submodule Procurement	Complete	Complete
	Tile L2/2	Tech Choice for F/E Electronics	Complete	Complete
	Tile L2/3	Start Module Construction	Complete	Complete
	Tile L2/4	Start Prod of MBs	1-Apr-01	Complete
	Tile L2/5	All Electronic Components Delivered to ATLAS	1-Oct-02	1-Oct-02
	Tile L2/6	Module Construction Complete	30-Sep-02	30-Sep-02
	Tile L2/7	All Modules Delivered to CERN	2-Dec-02	2-Dec-02



Tile Milestones

Level 3 Milestones (Goals)

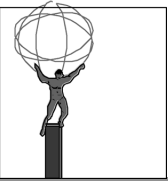
Subsystem	Schedule Designator	Description	ETC 01 Schedule Date	ETC 02 Schedule Date
Tile	Tile L3/1	Submodules Completed	15-Mar-02	15-Mar-02
	Tile L3/2	Extended Barrel Module	2-Dec-02	2-Dec-02
	Tile L3/3	Extended Barrel Optics	30-Sep-02	31-Oct-02
	Tile L3/4	PMT Block	2-Sep-02	2-Sep-02
	Tile L3/5	Readout Electronics	3-Jun-02	28-Aug-02
Inter. Cal	Tile L3/6	Gap Submodules	15-Jul-02	15-Jul-02
	Tile L3/7	Cryostat Scintillators	N/A	N/A



Tile Milestones

Level 4 Milestones (Baseline Scope)

WBS	Schedule Designator	U.S. ATLAS Responsibility Completion Description	ETC 01 Planned Completion Date	ETC 02 Baseline Scope Completion Date	ATLAS Required Date	ETC 02 Planned Float (Months)
Tile						
1.4.1	Tile L4/1	Submodules Production Complete	7/01	Complete	8/01	N/A
	Tile L4/2	EB Module Ship to CERN Complete	12/01	Complete	7/02	N/A
1.4.2	Tile L4/3	Optics Instrum at ANL & MSU Complete	9/02	10/02	11/02	1
1.4.3	Tile L4/4	PMT Ship to ATLAS Complete	1/02	1/02	7/02	6
1.4.3	Tile L4/5	Readout Ship to ATLAS Complete	6/02	8/02	9/02	1
1.4.4	Tile L4/6	Gap Submodules Ship to ANL & BCN Complete	7/01	Complete	8/01	N/A
1.4.1	Tile L4/7	Submodules Construction Compl (Qty. 576)	3/02	3/02	7/02	4
1.4.1	Tile L4/8	EB Module Ship to CERN Complete (Qty. 64)	12/02	12/02	1/03	1
1.4.4	Tile L4/9	Gap Submodules Ship to ANL & BCN Complete (Qty. 128)	7/02	7/02	7/02	0



Installation Schedule

- **Preassembly EBC 4/02 – 11/02**
- **Preassembly Barrel 12/02 - 6/03**
- **Preassembly EBA 7/03 - 11/03**
- **Install EBC-Barrel-EBA or Barrel-EBC-EBA 12/03 – 11/04**



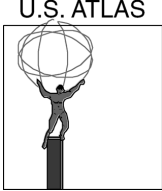
Installation

- **Module placement and shimming**
 - ◆ Engineering (US provides 1 FTE of 3, technicians (US provides 1.5 FTE of 7)
 - ◆ Survey
- **Readout drawer installation**
 - ◆ Technicians (US provides 0.75 FTE of 3)
- **Service connections**
 - ◆ Technicians (US provides 0.5 FTE of 2)
- **Cost: \$842K**



Conclusions

- **Major components are well advanced in production**
- **Modules continuing on schedule.**
- **Readout electronics schedules have been adjusted for several month delays due to delay in receiving parts and design iterations**
- **Preparing for preassembly and assembly stages plus design and analysis of support structures**



Tile Calorimeter Maintenance and Operations; Upgrade R&D

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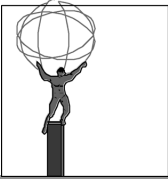
Outline

- **Needs to be supported by pre-operations, commissioning, M&O**
- **Impact of receiving NO support in:**
 - ◆ **FY03**
 - ◆ **FY04**
- **Upgrade R&D plans**



Installation Schedule

- **Preassembly EBC 4/02 – 11/02**
- **Preassembly Barrel 12/02 - 6/03**
- **Preassembly EBA 7/03 - 11/03**
- **Install EBC-Barrel-EBA or Barrel-EBC-EBA 12/03 – 11/04**



Work Before Installation (2002-3)

- **Source testing and calibration**
- **Beam test 8 modules x 3 sections**
 - ◆ **2002-2004**
 - ◆ **Modest US technical support**
- **Preamssembly**
 - ◆ **Engineering (US provides 1 FTE of 3)**
 - ◆ **Technicians (US provides 1.5 FTE of 7)**
- **Support design and analysis**
 - ◆ **0.7 FTE-yr Engineer (half already done)**
 - ◆ **0.3 FTE-yr Designer (half done)**
- **Support procurement**
 - ◆ **0.2 FTE Engineer**



Work for Commissioning

- **Beam test 8 modules x 3 sections**
 - ◆ 2002-2004
 - ◆ Modest US technical support
- **Cosmic ray data taking and analysis**
 - ◆ All physicists?
- **Electronics validation and calibration**
 - ◆ Repairs (engineer, technicians)
- **Software development and testing**
 - ◆ Computer professionals



Work for M&O

- **Mechanical support of endcap moving and access**
 - ◆ Engineers, technicians
- **Electronics validation and calibration**
 - ◆ Repairs
 - ◆ Access to electronics drawers during shutdowns
- **PMT testing and replacement**
 - ◆ Technician
- **Testbeam support and operations**
 - ◆ Modest US technical support
- **Software support of operations and testbeam**
 - ◆ Computer professionals



Tile Cost Summary

WBS Number	Description	Class.	FY01	FY02	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)	FY 06 (k\$)	FY 07 (k\$)
	Tile Calorimeter Pre-Assembly			209	259	341	740	0	0
	Tile Calorimeter System M&O			0	359	659	900	957	760

WBS Number	Description	Class.	FY 08 (k\$)	FY 09 (k\$)	FY 10 (k\$)	FY 11 (k\$)	FY 12 (k\$)	Total (k\$)
	Tile Calorimeter System Installation		0	0	0	0	0	1549
	Tile Calorimeter System M&O		760	760	760	760	760	7433

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Funding Source : All

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	Total
Faculty											.0
Sr Research											.0
Term Scientist											.0
Post Doc											.0
Grad Student	.6	.5									1.1
Mechanical Engineer	.9	.4	.5	.5	.2	.2	.2	.2	.2	.2	3.5
Electrical Engineer	.6	1.0	1.3	.5	.2	.2	.2	.2	.2	.2	4.6
Technical	3.3	5.0	6.2	2.4	1.9	1.9	1.9	1.9	1.9	1.9	27.4
Computer Designer	.2	.8	1.4	1.8	1.3	1.3	1.3	1.3	1.3	1.3	11.6
Adminsitration	.2										.2
Contract Labor											.0
TOTAL LABOR	5.8	7.7	9.4	5.1	3.6	3.6	3.6	3.6	3.6	3.6	49.6



Upgrade

- **Fabrication of scintillator and fibers for cryostat scintillator layer**
 - ◆ Mechanical cases and hangers done on original project
- **Installation and commissioning of cryostat scintillator**

WBS Number	Description	Class.	FY01	FY02	FY 03 (k\$)	FY 04 (k\$)	FY 05 (k\$)
• (Fate of MC PMTs?)							
4.4.4	Tile Upgrades				268	163	47
4.4.4.1	Cryostat Scintillators				268	163	47
4.4.4.1.1	MSU				268	163	47



Summary

- **M&O starting NOW with preassembly and calibration**
- **Continued support is needed in 2003 for preassembly and test beam**
- **2003-2004 will be the main period of installation.**
- **M&O will continue in 2004 with test beam and electronics testing**
- **2005-2006 cosmic ray testing**
- **2007-on Operations: readout maintenance and test beam work will dominate**